Highlights

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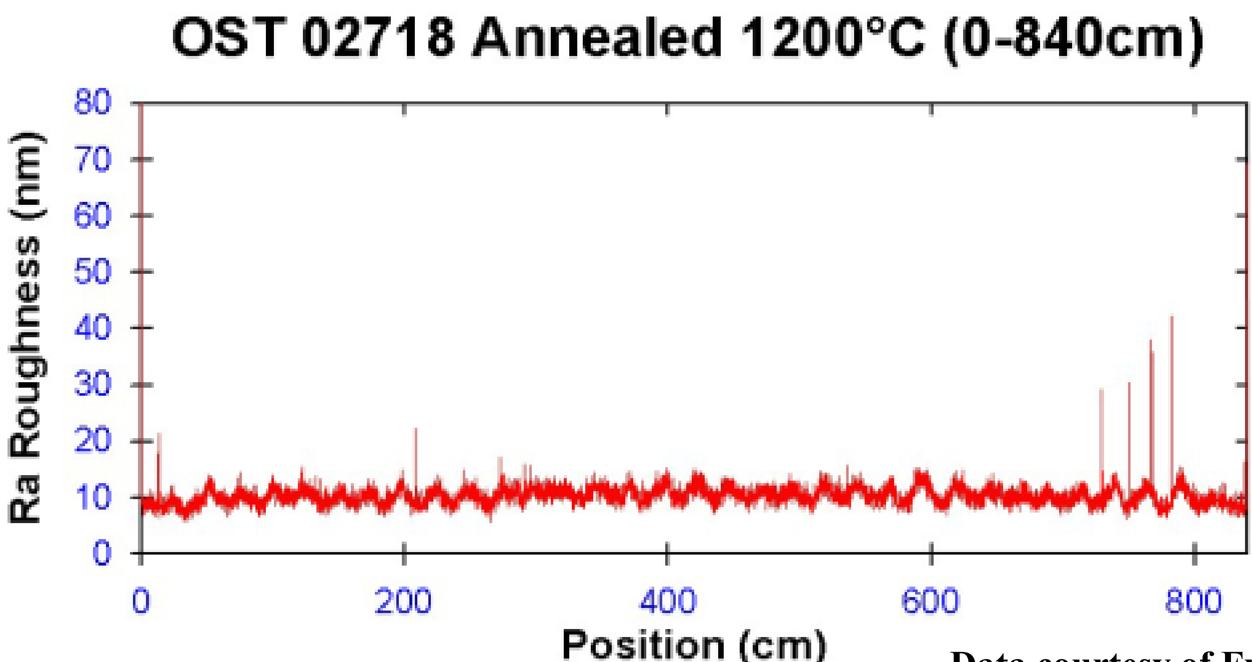
Textured Metal: Summary Status

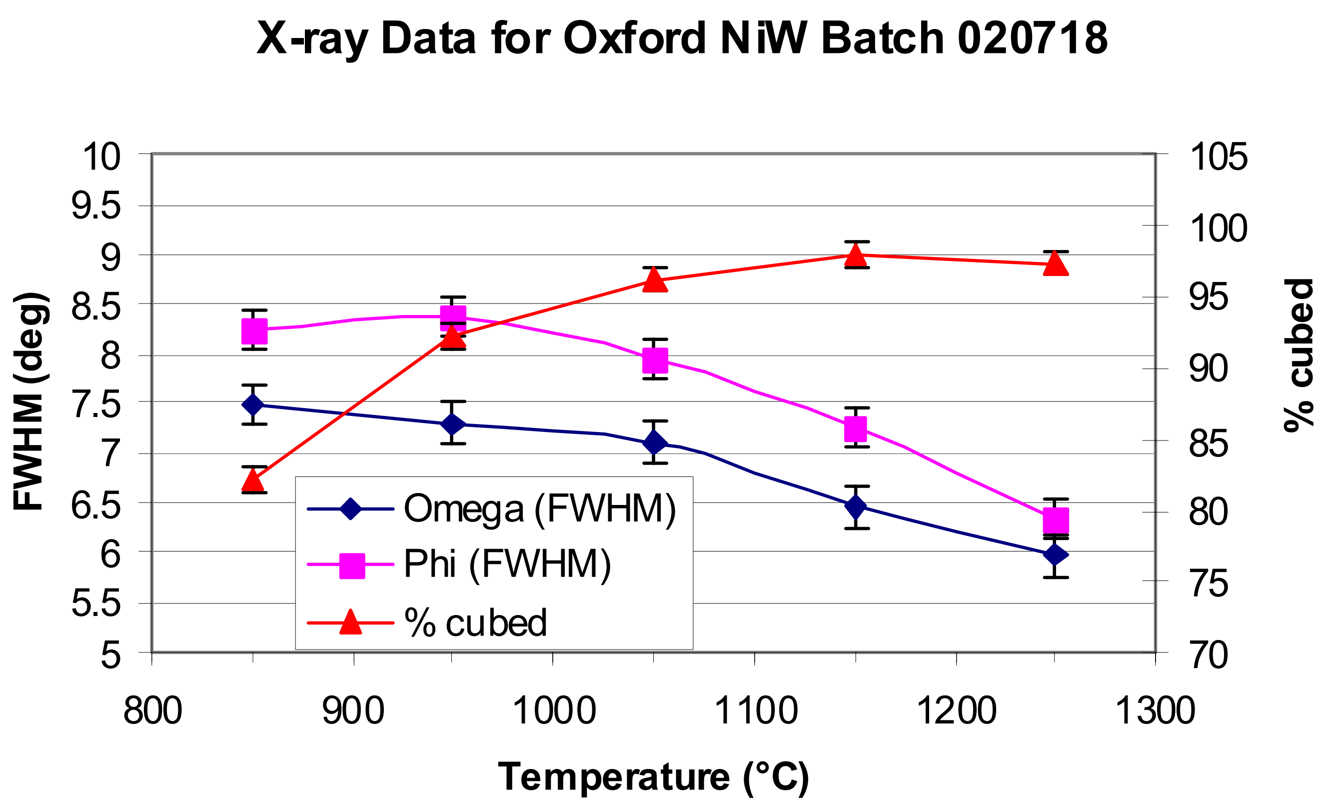
- 100 m lengths of continuously annealed Ni and Ni-3%W strip
- Anneal rates ~10 m/hr
- Surface roughness ~10 nm (measured by scatterometry)



Data courtesy of Fred List, ORNL

Textured Metal: Summary Status

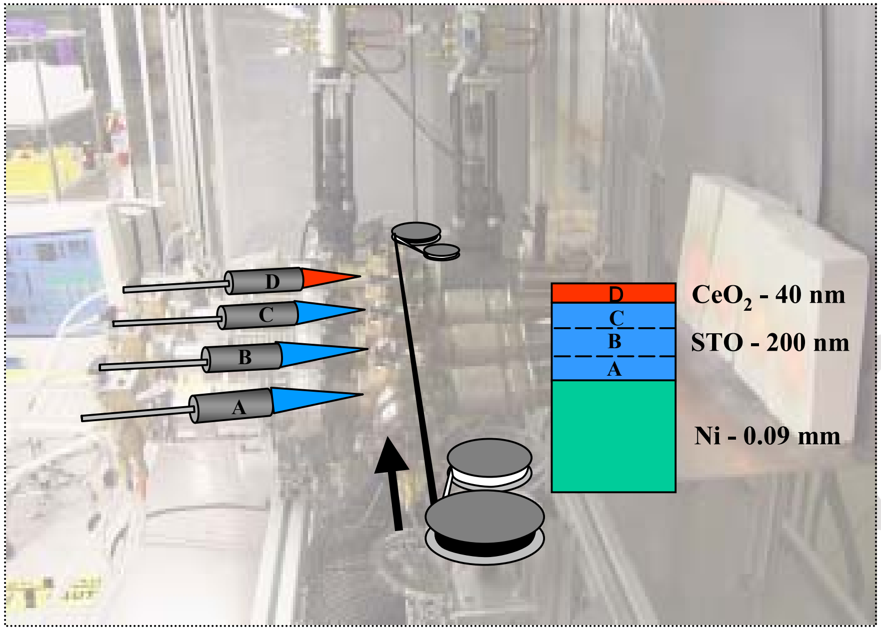
- Final texture developed depends on starting material, roll deformation parameters, and annealing temperature, time, and atmosphere.



Data courtesy of Lee Heatherly, ORNL

CCVD Buffer: Architecture Versatility

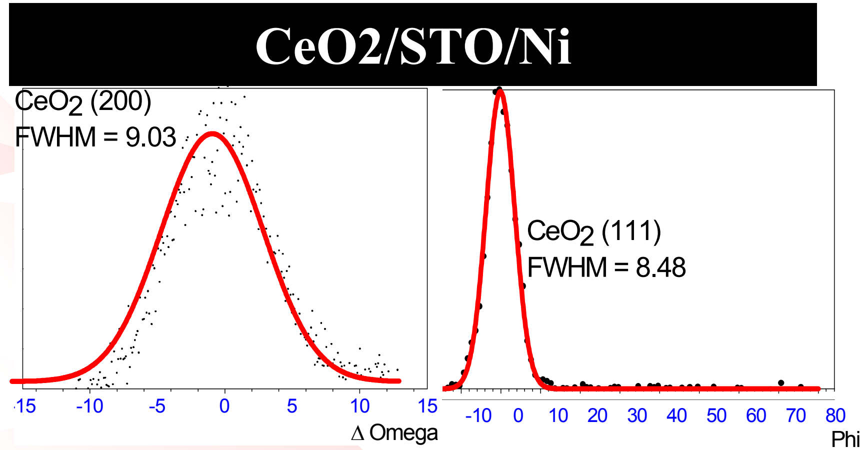
- **CCVD Technology**:
  - Atmospheric pressure flame based deposition of epitaxial buffers on reel-to-reel biaxially textured Ni or Ni-W tape.

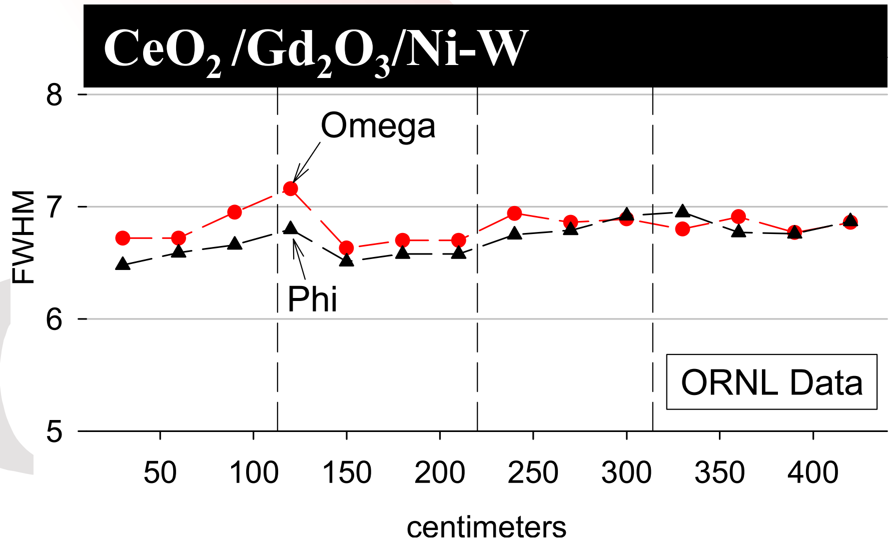


- **CCVD Advantages**:
  - Multi-layering flexibility
  - Coating stoichiometry control and flexibility
  - Non-vacuum, long length process
  - Lower capital and material costs
  - Non-hazardous, environmentally friendly
- **Standard architecture**
  - 10-50 nm CeO_2 cap/ 200 nm STO/BST seed
- **Other materials**
  - Gd_2O_3, LAO, LMO, LZO, Y_2O_3, YSZ

CCVD Buffer: Properties on Ni and Ni-W

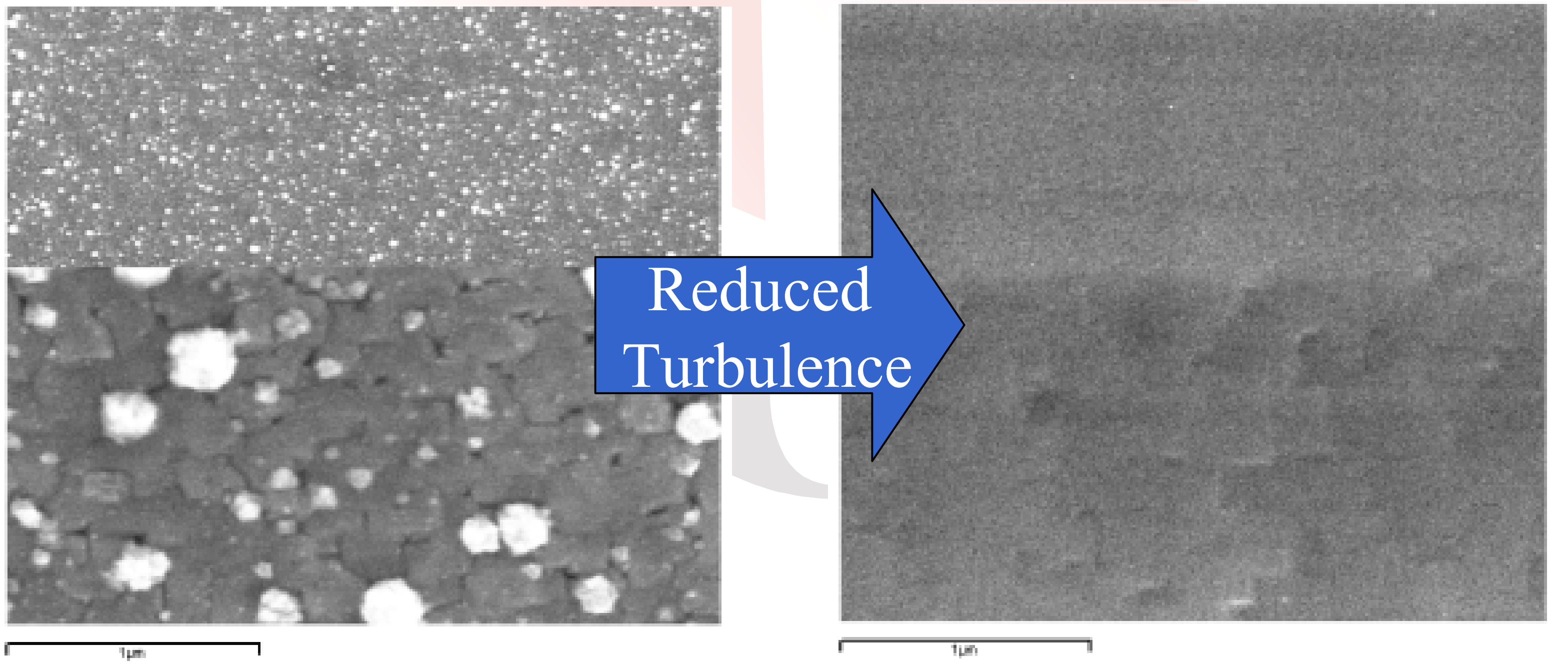
- **Excellent Epitaxy**
  - BST, STO, and CeO_2 directly on Ni
  - CeO_2 and Gd_2O_3 directly on Ni-W
    - 0% in-plane misorientation
    - < 2% out-of-plane misorientation
    - Phi and omega FWHM ≤ Ni
    - Uniform over meter+ lengths
- **Electrical Characterization**
  - J_C of 1.12 MA/cm^2 demonstrated for PLD YBCO (ORNL) on CCVD RABiTS with standard architecture
  - Minimal J_c has been demonstrated with other architectures





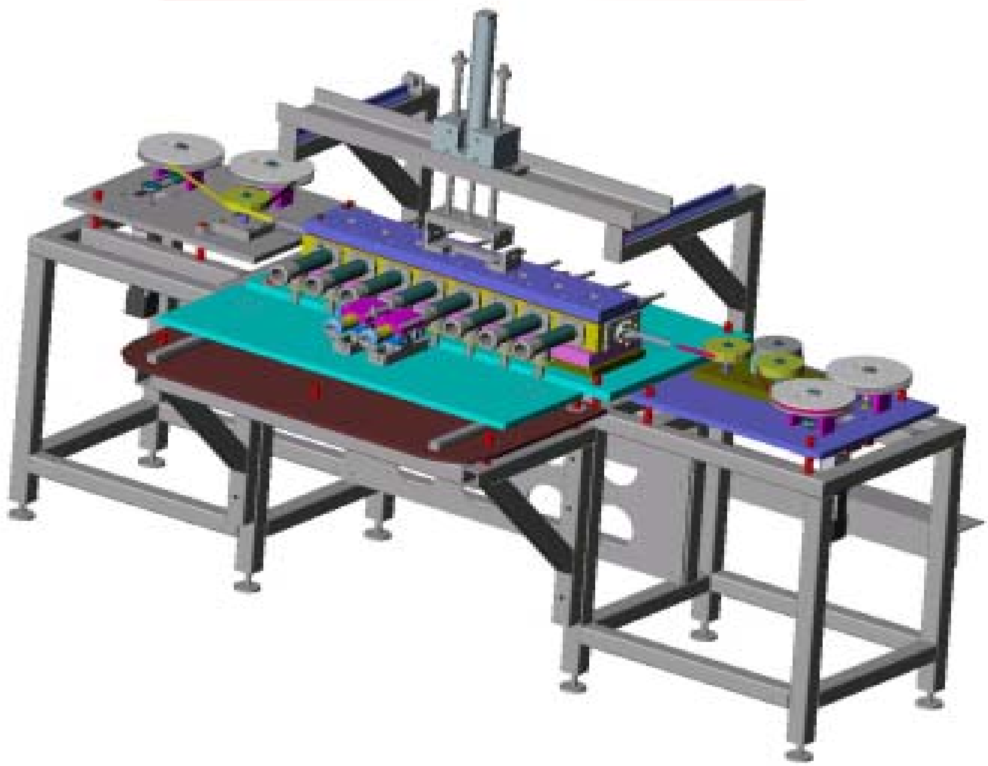
CCVD Buffer: Recent CCVD Buffer Improvements

- **Microstructure and Epitaxy Improvements**
  - Reduction of gas turbulence near deposition region has reduced particle formation
    - Smoother gas flow geometries
    - Lower gas flow rates
  - Smooth, dense STO microstructure
  - Reduced out-of-plane misorientation
  - Potential increase in subsequently deposited YBCO’s current carrying capability



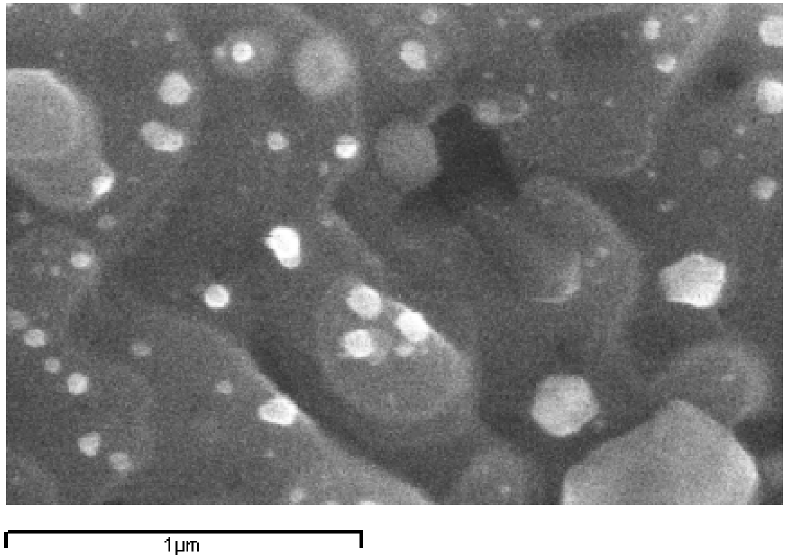
CCVD Buffer: Goals for FY 2003

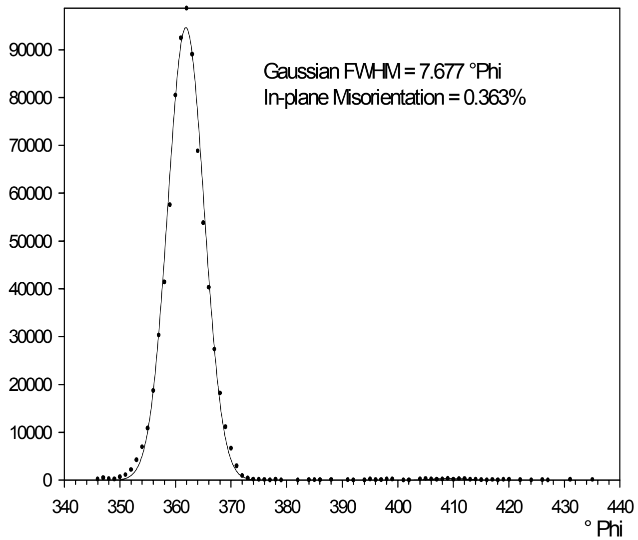
- Scale to 25+ meter lengths of high-quality CCVD RABiTS
- Enable critical currents of 100 amps for meter lengths (end-to-end)
- Optimize buffer architectures and properties on Ni and Ni-W
- Continue the sale of CCVD RABiTS in research quantities

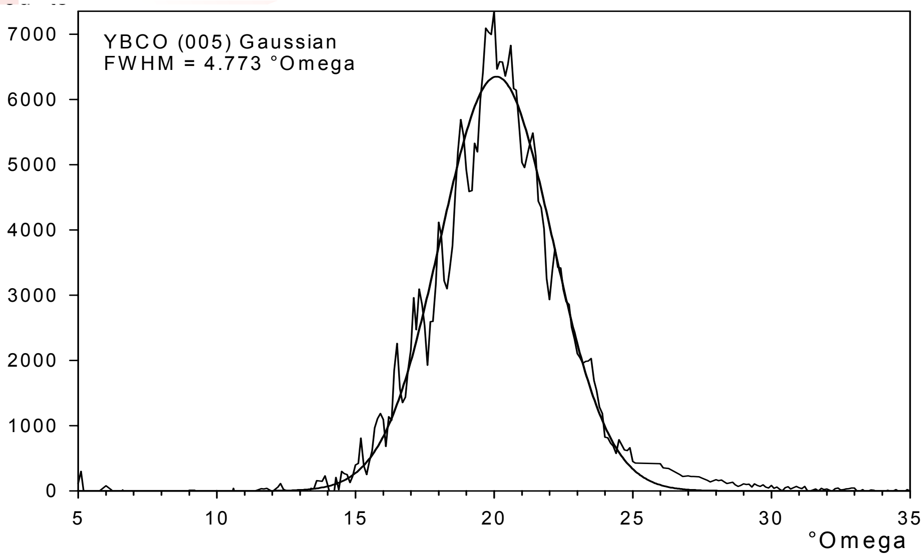


CCVD YBCO: Physical Properties on RABiTS

- **Microstructure**
  - Optimized deposition conditions
  - Improved density and surface roughness
  - Reduced large surface defects
- **Phase Formation**
  - Reduced $BaCe0_3$ formation
  - Reduced NiO formation
- **Epitaxy**
  - Reduced randomly oriented YBCO
  - Omega and Phi FWHM ≈ RABiTS

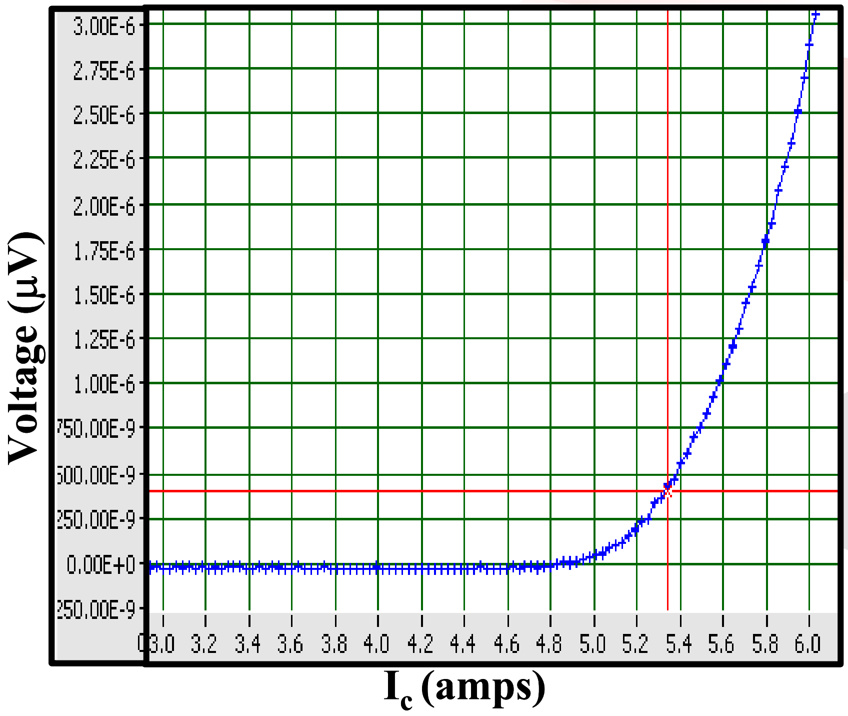




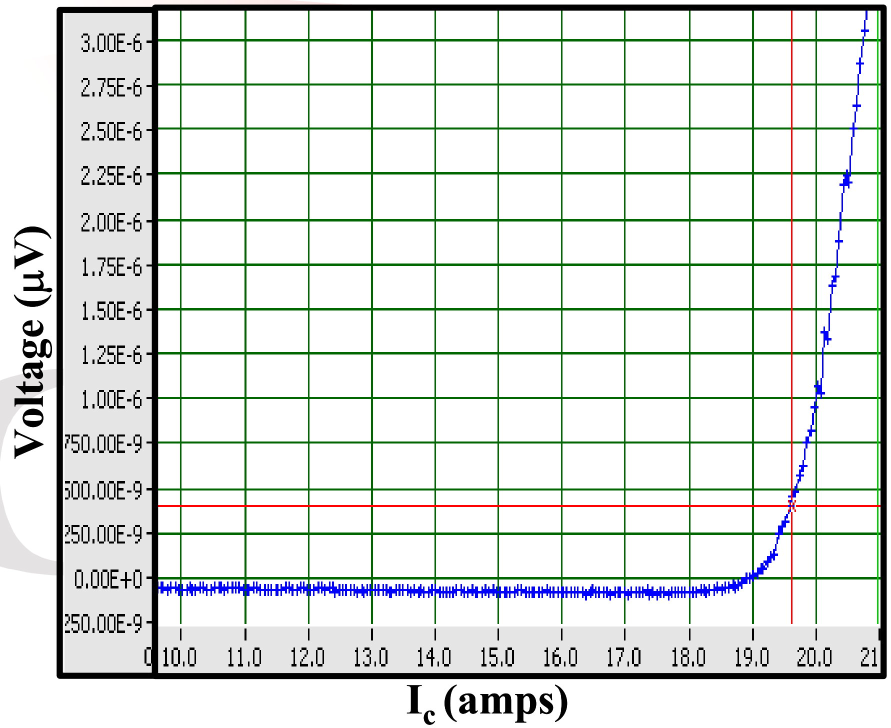


CCVD YBCO: Electrical Properties on RABiTS

- **Electrical Properties on CCVD Buffered RABiTS**
  - I_c= 5.33 A
  - J_c = ~ 0.6 MA/cm^2
  - T_c= 89 K (<2 K transition)



- **Electrical Properties on ORNL Buffered RABiTS**
  - I_c= 19.62 A
  - J_c= ~ 1.5 MA/cm^2
  - T_c= 91 K (<2 K transition)



CCVD YBCO: Goals for 2003

- **Scale YBCO from coupons to meter+ lengths**
  - All CCVD YBCO development has been performed in a reel to reel deposition system
- **Multiple path approach to improved CCVD YBCO on CCVD buffered RABiTS**
  - Work with CCVD buffer team to optimize buffer architectures for CCVD YBCO deposition conditions
  - Integrate process control capability that enables depositions at lower $p(O_2)$ and therefore lower temperature
- **Incorporate CCVD deposition chamber improvements developed by CCVD buffer team**
  - Increase deposition efficiency
  - Decrease surface roughness

Collaboration

- **MicroCoating Technologies**
  - Optimization and scaling of RABiTS buffer deposition
  - Optimization of YBCO depositions
- **Oxford Superconducting Technology**
  - Optimization of Ni and Ni-W tapes
  - Supplied Ni and Ni-W tapes for buffer development
- **ORNL**
  - MCT and ORNL have exchanged buffer layers
  - ORNL has provided MCT with Ni-W
  - ORNL has deposited YBCO on CCVD RABiTS
  - MCT has used the Accelerated Coated Conductor Initiative facility for reel-to-reel XRD and laser scatterometry
  - MCT has purchased a commercial license for RABiTS
- **LANL**
  - LANL has deposited PLD YBCO on CCVD RABiTS
- **BNL**
  - BNL has deposited BaF_2 YBCO on CCVD RABiTS